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Reviewer: Znojil, Miloslav

Reviewer number:

Address:
Theory Group0,
NPI AS CR,
250 68 Rez,
Czech Republic
znojil@ujf.cas.cz

Author: This line will be completed by the MR staff.

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Review text:

One of interesting properties of Schroedinger operators H with periodic and almost periodic potentials is that for an auxiliary Hamiltonian restricted to an infinitely deep d-dimensional box and for the states which lie below an energy-cutoff λ there exists an infinite-volume limit $D(\lambda)$ of their number per volume (called the density of states).

The problem addressed in the paper is an asymptotic estimate of the smallness of the difference $D(\lambda) - \lambda/(4\pi)$ (and/or of its trivial modifications) at $d = 2$. The result (viz., its proportionality to $\lambda^{-6/5+something}$ formulated as Theorem 2.3) is impressive.

The technical text itself presents the most important partial-differential generalization of the recent ordinary differential $d = 1$ result by the same author (ref. [25], to appear in 2005). In this setting, while the basic idea of the $d = 1$ proof lied in a "gauge" transformation of H into an operator with constant coefficients, the key novelty of the present construction lies in an adaptation of such a trick to $d \geq 2$. Naturally (and, in some preparatory lemmas, manifestly), the possibility of a future extension of the present result to $d > 2$ is kept in mind.